TREES AS A THEME IN MEDICAL GEOGRAPHY AND PUBLIC HEALTH

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A report in the *Transactions of the American Medical Association* in 1859 asserted "Many facts could here be collected...to show that certain trees and vegetable productions, growing in damp, swampy, and malarial countries, possess the property of disinfecting them."[1] This claim by Dr. Thomas M. Logan, a physician who later became secretary of the California State Board of Health and president of the American Medical Association—that vegetation, especially trees, has a significant beneficial influence on public health—expressed a view commonly held in both medical and lay circles through the 19th century. Logan's belief in the health benefits of "certain trees and vegetable productions" was related to the idea that various diseases, especially malaria, were caused by airborne toxins, but that other substances in the lower air were therapeutic for other diseases. These notions went back at least to classical times.

Many cultures revere trees and associate them with various forms of magic,[2] but attribution of health-giving powers to trees appears to be more limited. Ascription of healing powers to trees has long been established in the western tradition, and Pliny the Elder (A.D. 23-79) noted in his *Natural History*[3] that:

> It is well known that woods consisting only of those trees from which pitch and resin are scraped off are very beneficial to consumptives, or to those who cannot convalesce after a long illness, and that the air in districts so planted is more health-giving than a sea-voyage to Egypt, or than draughts of milk from cattle that have grazed along summer pastures in the mountains.

Pliny clearly suggests that pitch and resin-producing trees imparted some special property to the air of districts where they grew and that breathing such special air was beneficial to invalids and even therapeutic for that most serious of diseases, pulmonary tuberculosis.

Although Pliny's association of trees and health was to reappear perfectly intact in early 19th century America, different ideas were generally current during Colonial times. In prerevolutionary America it was com-

monly thought that an abundance of trees, far from being a salubrious influence, was actually detrimental to public health. Typical of such negative views on the health role of trees is a 1686 description of colonial Virginia in which that colony's numerous trees were considered a health threat because of their influence on lower air movements. It was argued that atmospheric circulation was "kept stagnant" by trees and that when air descended and passed over forest clearings as it "must needs in the violent heat of Summer, [it must] raise a preternatural Ferment, and produce bad Effects."[4]

Further support for the adverse health influence of trees and forests came a few years later from another London scientist, the physician John Woodward, who uttered an unqualified condemnation of trees and concluded:[5]

> ...Countries that abound with Trees, and the larger Vegetables especially, should be very obnoxious to Damps, great Humidity in the Air, and more frequent Rains, than others that are more open and free. The great Moisture in the Air, was a mighty inconvenience and annoyance to those who first settled in *America;* which at that time was much overgrown with Woods and Groves. But as these were burnt and destroy'd, to make way for Habitation and Culture of the Earth, the Air mended and clear'd up apace, changing into a Temper much more dry and serene than before.

A few decades later another colonial physician, Hugh Williamson, from Pennsylvania, also endorsed the opinion that clearing forests improved public health and ameliorated the climate of the "middle colonies" of North America. Thus, in a paper read before the American Philosophical Society in 1770 Dr. Williamson declared:[8]

> While the face of this country was clad with woods, and every valley afforded a swamp or stagnant marsh, by a copious perspiration through the leaves of trees or plants, and a general exhalation from the surface of ponds and marshes, the air was constantly charged with a gross putrescent fluid. Hence a series of irregular, nervous, bilious, remitting and intermitting fevers, which for many years have maintained a fatal reign through many parts of this country, but are now evidently on the decline. Pleuritic and other inflammatory fevers, with the several diseases of cold seasons, are also observed to remit their violence, as our winters grow more temperate.

William Currie, also a Pensylvanian physician, expressed similar anti-tree views in a book published in 1792 entitled *An Historical Account of the Climates and Diseases of the United States of America etc.* Currie emphasized the importance to good public health of open locations and "free ventilation." His views on the subject of trees and health are well

illustrated by the section dealing with South Carolina:

> ...because the Air does not receive sufficient Ventilation to be conducive to Health by any other means in this Climate: But till the Land is more cleared our Atmosphere cannot be wholly renewed even by a Hurricane; because the Wind cannot penetrate such an extent of close Woods, which are even impervious to the Sun's Rays, and where the Air contracts a mephitic quality by close confinement, and the impregnation of the fixed Air, after it has been set at liberty by the putrefaction of decaying Vegetables, &c. It is therefore probable that the generality of the Land Winds rather tend to vitiate than to purify the Air with which they come in contact, and that the Winds which come from the Sea are the only ones that purify it at present.[7]

Although Currie generally regarded forests as a baneful health influence, he did qualify his position and noted that parts of New Jersey that were "dry, sandy, and produce nothing but pine and spruce, are famous for prolific women."[8]

B. Henry Latrobe, an engineer, commenting in the 1790s on Cape Henry, argued that extension of forest clearing in that region was permitting ocean winds to extend their influence and thus "blow health and coolness over a portion of lower Virginia, which is now considered as extremely unhealthy."[9]

While many Colonial and early American scientists held that trees were more or less detrimental to public health, by the end of the 18th century others viewed the trees and health relation in somewhat different terms. Among these was the celebrated Dr. Benjamin Rush who, rather than positively correlating tree cover and disease incidence as some of his predecessors had done, averred that deforestation had actually increased the prevalence of "intermitting and bilious fevers" in Pennsylvania. In Rush's words, these diseases had increased "in proportion as the country has been cleared of its wood."[10]

While this might suggest clear support for the belief that trees exerted a direct sanitary influence, Rush's position was more complicated and qualified because he attached special importance to cultivation as a source of public health. According to Rush, "Clearing a country makes it sickly" but "*cultivating* a country, that is, draining swamps, destroying weeds, burning brush, and exhaling the unwholesome or superfluous moisture of the earth, by means of frequent crops of grain, grasses, and vegetables of all kinds, render it healthy."[11] Thus, Rush apparently ascribed the healthful benefits of forest clearing to the cultivation that deforestation made possible rather than to the clearing itself.

Rush shared a common belief of his time that natural vegetation, especially decaying natural vegetation such as might be found in most midlatitude forests, was somehow injurious to health, whereas crop plants were not. Accordingly, he advocated that cultivation be extended as soon as forests were cleared. Rush evidently suscribed to the then-popular belief that newly settled areas started out healthy but underwent deterioration of health conditions before salubrity eventually returned. He described how in several sections of America as forest clearing proceeded, "Fevers soon followed their improvements," and wrote that these were not "finally banished, until the higher degree of cultivation" was achieved.[12]

The cycle of deterioration and amelioration of health conditions in pioneer settlements which Rush mentioned involved a portion of the miasmatic doctrine holding that previously uncultivated soil supposedly formed a source for disease-causing atmospheric toxins. It was then widely believed that plowing and cultivation released miasmatic poisons into the air to cause various diseases, especially malaria. Continued cultivation also was believed to exhaust the sources of miasma in the soil and to lead to improvement of health conditions with time.

While Benjamin Rush's convoluted reasoning placed trees in an essentially neutral health role, others thought of them in more positive terms. Noah Webster, the pioneer lexicographer and epidemiologist, believed trees entirely and directly beneficial to public health. Webster thought trees especially desirable in cities and noted that "They make a pleasant shade—they imbibe the septic fluids, which impregnate the atmosphere of cities, and poison their inhabitants—they exhale pure air."[13] Benjamin Franklin apparently shared Webster's views, as suggested by a letter Franklin wrote a few years earlier: "...I wish we had two rows of them [trees] in every one of our streets. The comfortable shelter they would afford us in walking, from our burning summer suns, and the greater coolness of our walks and pavements...the improved health of the inhabitants...."[14]

Webster took particular exception to the argument advanced earlier that trees were unhealthful influences because they impeded air circulation near the ground and permitted the accumulation of disease agents in the lower air. Webster denied this and asserted that trees, far from diminishing lower level air currents, actually promoted air movement, supporting this with the claim that the motion of tree branches and leaves was a cause rather than a consequence of air circulation:[15]

> In calm summer weather, they [trees] very much increase a light breeze, by partly obstructing the upper current with their branches, and throwing more air below, thus augmenting the under current on the surface of the earth, where it is wanted. The leaves and branches also, by their gentle motion, agitate the air, preventing the ill effects of stagnation; and give velocity to the air that finds its way through their interstices.

Soon after Webster's advocacy of planting trees for hygienic reasons, Samuel George Morton published the first American book on pulmonary tuberculosis in 1834 which held that trees performed important health functions. Illustrating the lack of progress in treating consumption during almost two millenia, Morton offered the therapeutic counsel of classical times. He wrote that "experience has amply proved that a dry air, in conjunction with the aroma of pine forest, is most congenial to delicate lungs." He went on to report, "I have myself seen stubborn and almost inveterate catarrhs, which resisted every mode of treatment, cured in a very few days by exchanging the city air for that of the pine region of New Jersey."[16]

Pliny's view of trees and health increasingly was adopted and considered validated as the 19th century advanced. Contemporary literature reveals expanding belief in the therapeutic and prophylactic value of trees and forests, and by the middle of the 19th century this belief was firmly implanted in both lay and medical opinion. The introductory chapter to R. U. Piper's monumental 1855 botanical work, *The Trees of America,* illustrates this belief: "...the leaves of trees are said to absorb all noxious qualities of the air, and to breathe forth a purer atmosphere...." Piper also attributed psychological benefit to trees and extolled the "serene and settled majesty in woodland scenery, that enters into the soul, and dilates and elevates it, and fills it with noble inclinations."[17]

A more detailed and authoritative consideration of the supposed relation between trees and health in this period was contained in an 1863 report of the United States Sanitary Commission. Prepared for military use during the Civil War, this report attempted to summarize the state of knowledge according to the "highest medical authorities" with regard to "miasmatic fevers" caused by "paludal poison," "marsh miasmata," or "malaria." Displaying a caution not always evident in the epidemiology of the day, the report expressed complete ignorance of the "intimate nature" of the toxins supposedly responsible for miasmatic fevers. The commission suggested, however, that of the hypotheses advanced to date the most plausible involved the "sporules of cryptogamic plants" or the infinitesimal ova

of infusoria.'' Nevertheless, it was emphasized that these were[18]

> ...mere theories, unsupported by demonstration addressed to the eye, through the medium of the most perfect microscopes; nor have the partisans of the atmospheric or gaseous hypothesis been successful in attempting to show, by eudiometry, the existence of any peculiar matter in the air of infected places.

Although acknowledging that the existence of miasmatic disease agents was unproved, the commission believed that empirical evidence confirmed the reality of such atmospheric toxins. Using similar pragmatic reasoning, the commission also attributed major importance to trees for their effect on the dissemination of miasmatic disease agents. A summary of the report's conclusions was presented in 13 statements which sought to summarize the ''certain knowledge concerning malaria.'' While these 13 statements read like a catechism of the miasmatic doctrine of disease causation, they also demonstrate the role assigned to trees in the supposed etiology of malaria, one of the most widespread diseases of the period. Two of the report's conclusions directly concern trees:[19] ''It [the miasmatic disease agent] has an affinity for dense foliage, which has the power of accumulating it, when lying in the course of winds blowing from malarious localities. Forests or even woods, have the power of obstructing and preventing its transmission, under these circumstances.''

The report clearly underlines the conviction that trees have the capacity to absorb and obstruct air-borne poisons that were supposed to cause the diseases subsumed under the malarial category.

Further illustration of the relation supposed to exist between miasmatic diseases and forests in mid-19th century America, along the same lines as the sanitary commission's report, is provided by a series of articles entitled ''The Miasmatic Diseases of California'' by J. Campbell Shorb, a San Francisco physician. Shorb confirmed views expressed a few years earlier in the sanitary commission's report whereby trees were declared capable of impeding the progress of the *materia morbi* that produced malaria, and cited a situation in Oregon where a quarter-mile-wide belt of pine forest had effectively protected a small town from ''miasmatic visitation.'' According to Shorb, the disease agent of malaria was not ''intensely etherialized'' (thoroughly mixed or chemically combined with air) but occurred as a ''union of a grosser kind'' and that, therefore, ''The forest, like a large mechanical sieve, sifts through the fresh air free from all impurities and disease, and holds the deleterious principle imprisoned on its thousand boughs and leaves, until it perish or disappear.''[20]

Evidently Shorb imagined trees to extract miasma from the air in the manner of a filter. Others believed that something akin to magnetism was involved, and it was declared that "malaria has an attraction for trees and other organic material."[21] Still others sought understanding through chemical processes. For example, one key was considered to be ozone; forests, it was argued, produce ozone and this substance had been found "to be more abundant in pine forests than the open country in summer, but less abundant in winter."[22] Accordingly, it was proposed that[23]

> The terebinthate vapors exhaled by coniferous plants, possess to a greater degree than any other known substance, the power of converting the oxygen of air into ozone. It cannot be questioned but that ozone is the chief natural purifying agent of our atmosphere from all organic matter.

Some middle 19th century investigators attempted to explain the supposed sanitary influence of trees in terms of botanical processes and saw connections with the mechanisms of photosynthesis, an aspect of plant physiology then being elucidated. Typical of such botanically inspired explanations of the healthful influences of trees was the work of George B. Emerson in 1875. Emerson first noted that the "influence of the forest upon the heathfullness of the atmosphere demands thoughtful consideration" and went on to suggest that this influence was associated with the fact that "plants imbibe from the air carbonic acid and other gaseous and volatile products, exhaled by animals, or developed by the natural phenomena of decomposition."[24]

Also addressing this problem in 1875, W. P. Gibbons, a prominent California physician, also saw plant physiology as the key to the health-enhancing function of trees. In a paper titled "On Forest Culture as a Prophylactic to Miasmatic Diseases," Dr. Gibbons took the standard miasmatist position that the "proverbially unhealthy atmosphere of swamp land is due to stagnant water" occurring under appropriate temperature conditions. Gibbons believed that the value of trees in reducing the disease-causing marsh miasm was derived from their capacity to absorb and transpire ground water.[25]

Although Gibbons thought that all trees exerted some hygienic influence, he believed that those of the genus Eucalyptus were especially effective because of their rapid growth. Eucalyptus would thrive only in mild climates, of course, but it happened that these regions were most beset with malarial problems. Accordingly, he proposed a program of sanitary reform for California based entirely on the extensive planting of

Eucalyptus. Gibbons believed that the main health problem involved California's Central Valley, which then contained 6,000 square miles of "overflowed lands" that produced vast amounts of "marsh miasm." Planting a two-mile-wide belt of Eucalyptus along the entire 375-mile length of Central Valley, according to Dr. Gibbons' calculations, would vaporize more than seven billion gallons of water daily, thereby reducing ground moisture and, in turn, the production of "marsh miasm."[26]

Gibbons, like many of his contemporaries, thought that the sanitary influence of trees operated through two distinct principles: by preventing the formation of miasma at the source and by removing miasma once formed. Thus, reduction of ground moisture by trees, performed most efficiently by Eucalyptus, prevented or diminished the actual production of miasma. Once present in the air, however, miasma could be extracted by trees and its baneful influence thwarted. The extraction process, according to Gibbons, took place in leaves ("the laboratory of the vegetable world") where "marsh miasm" was rendered harmless and "the purity of all other substances that are exhaled either in a simple or compound form" was restored. He concluded: "...in whatever shape marsh miasm may exist—whether held in solution by water and diffused in the vapor of night, or retained in the soil and liberated by the presence of water—it is certain to be destroyed by the adequate development of forest growth."[27]

In some cases advocacy of a health role for trees and forests was the work of committees constituted to investigate the matter. Thus, in 1876 the Georgia Board of Health, a body justly concerned with malaria, issued the report of a committee appointed expressly to examine the health influence of trees. The report, written by Dr. Benjamin M. Cromwell, considered both the "climatic influence of trees" and the "direct, specific influence they exert by means of the odorous emanations they give off from their leaves, bark, wood or gum."[28] Cromwell's report summarized the sanitary influences of trees as follows: By keeping up the springs, streams, and water courses of a country, and thus maintaining its water supply, by facilitating the drainage of surface water, they are thus instrumental in drying up low, marshy places that generate miasm, by imparting moisture to the atmosphere by the evaporation that goes on through their leaves, and by keeping the earth under them cool and moist by the shade they afford, and by acting as screens, breaking the force of strong winds, and by protecting localities from poisonous emanations generated to the windward of them.[29]

Cromwell's report elaborated on each of the four groups of influences but paid particular attention to the manner whereby trees were believed to protect localities against "poisonous emanations" that caused malaria. As usual, explanations were made difficult by the lack of positive identification of a disease agent whose existence seemed virtually confirmed by numerous observations. Cromwell considered two possible forms of the disease agent of malaria: an "emanation" or an "organism belonging to the lowest order of vegetable life." For an "emanation" the possibility that forests might exert a screening influence theoretically was plausible and congruent with "the experience of all physicians who have practised in malarial districts."[30] However, if the disease agent were some kind of "organism," then the screening theory was untenable on the grounds that "there is no probability...that the odorous emanations of certain families of trees are repellent to this lowest order of vegetation." Cromwell concluded, as had Shorb with his filter theory, that the well-known health benefit produced by a "skirt of woods" probably resulted from "... *sifting* the currents of air that pass through them of all infecting germs and spores they contain, allowing the air to emerge on the other side freed from these impurities."[31]

Another state board of health report, this time in Michigan and prepared by Dr. John S. Caulkins in 1882, addressed itself only to whether diseases are caused and worsened by a "lack of timber in a country." An affirmative answer was given. Among the health problems which Caulkins listed as being caused or exacerbated by a deficiency of trees were diseases of the eyes (the result of dust and glare in treeless areas) and skin (including leprosy, which he correlated with treeless areas of the world). Most important, however, according to this report, was the "ordinary autumnal or intermittent fever [malaria]," because if the poison that causes this disease "meets with a belt of trees in foliage, its progress is effectually barred." In Caulkins' view the effectiveness of trees in leaf as a *cordon sanitaire* was beyond question: "There is no doubt whatever resting on this statement: Trees do have the power, certain kinds at least and probably all to some extent, of purifying the atmosphere by absorbing or neutralizing its malaria [i.e. the disease agent]; they are malaria eaters or killers, most likely the last."[32]

Because leafy trees were firmly believed to exclude or eliminate the supposed agent of malaria, it was assumed that trees and shrubbery around dwellings would promote health. Accordingly, plantings were urged, espe-

cially on the side of the house upwind to some miasma source such as a pond or swamp. The procedure was thus sanctioned by one authority: "It is found to be perfectly practicable to prevent the access of malaria to dwellings by planting large trees or thick shrubbery in the immediate vicinity between the originating points and the house to be protected."[33] There were, however, dissenting views on this issue, usually invoking the superior hygienic significance of light and fresh air. Professor W. H. Brewer of Yale University, while praising the esthetic value of trees in cities and around dwellings, suggested that such vegetation's shade might adversely affect the health of the building's occupants. Echoing earlier views of the health significance of forests, Brewer further claimed that "forests on the whole are unhealthy to live in" and that the northern United States has "grown less malarial with the clearing up of the forests." According to him, dampness associated with tree-shaded dwellings caused health problems.[34]

Although dissenters such as Professor Brewer were doubtful or negative concerning the health role of trees, such views were comparatively rare. The subject drew increasing attention after the 1850s and interest appears to have peaked during the late 1870s. By about 1880 a considerable body of medical opinion endorsed the belief that trees provided important health benefits, especially with regard to malaria and tuberculosis. By this time many articles, reports, and editorials had spread the message that trees were prophylactic and therapeutic for various diseases, notably malaria, and, as time went on, pulmonary tuberculosis.

The explanation of the supposed prophylactic and therapeutic action of trees was similar for pulmonary tuberculosis and malaria. Coniferous forests were still viewed as especially beneficial and a typical testimonial spoke of "the exemption of our pine forests from consumption, malaria and germ diseases."[35] Such terms as "Balsamic exudations" and "air purity" were used in connection with both diseases. Among the more influential exhorters of a form of tree-therapy was Dr. Edward L. Trudeau, pioneer in the sanitarium treatment of tuberculosis. Trudeau advocated the Adirondack Mountains of New York as therapeutic marvels for consumptives:[36]

> The forests of this region are almost unbroken, stretching over the valleys, covering the mountains often to their very summit, and extending in some directions for nearly a hundred miles, while innumerable lakes dot this elevated plateau and give moisture to the air. That the atmosphere of such a region, especially when set in motion, should, by its contact with myriads of tree-tops

> and pine sheaves, become heavily laden with ozone is a natural sequence. Whatever other properties this gas may be hereafter found to possess, we know that it is a powerful disinfectant and Nature's choice agent for counteracting atmospheric impurities. This process, which during the summer months is carried on by all varieties of trees, during the winter months is maintained by the evergreens, while the deciduous trees are deprived of their foliage. Pine, balsam, spruce, and hemlock trees abound, and the air is heavily laden with the resinous odors which they exhale. An agent which it is universally admitted exerts a most beneficial influence on diseased mucous membranes is thus brought in contact with the air-passages, while balsamics, which are also disinfectants, purify the atmosphere, which is constantly impregnated with them.

Inquiry into the supposed relation between forests and health was not entirely an American concern, although the vast extent of tree cover in the country and accelerating deforestation emphasized the matter. Similar concern with the trees and health issue existed in Europe, especially France. Several French articles on the topic were translated and published in American scientific journals to inform the Americans of European developments. One such article, written by Mr. Becquerel and translated from French for the Smithsonian Institution in 1867, reviewed European thought on the sanitary influence of trees. The argument followed the familiar miasmatic pathways. Becquerel said that trees were significant, but the miasma-producing tendencies of the soil also had to be taken into account. Thus, he maintained that clearing away forests was not "prejudicial to salubrity...if the soil is siliceous or calcareous and the subsoil permeable." However, he said if both soil and subsoil are argillaceous (clayey) then clearing forests will be damaging to public health, because tree roots are needed to facilitate the drainage of soil. Even so, the insalubrity caused by the clearing of forests from clay soils could be avoided if "drainage is used to remove the stagnant water."[37]

Also consistent with American thinking were Becquerel's warnings about dangers to public health if "the woods which are removed existed in the proximity of swamps producing pestilential miasms, like the Pontine marshes." As the United States Sanitary Commission and many others in America had explained, trees in this situation either filtered or shielded out the disease-causing materials from the air. Becquerel described the process as follows:[38]

> A forest, interposed in the passage of a current of humid air charged with hurtful miasms, sometimes preserves from their influence any tract which is thus sheltered....Trees, therefore, tend to purify an infected air by absorbing or obstructing its pestilential constituents.

If trees indeed were the source of significant health benefits, then the wholesale destruction of forests occurring in 19th century America was likely to have undesirable hygienic side effects. This was the prevailing view. Even such sophisticated students of the environment as George Perkins Marsh asserted, "It is well known that the great swamps of Virginia and the Carolinas are healthy, even to the white man, so long as the forests in and around them remain, but become insalubrious when the woods are felled."[39] Medical opinion confirmed such views, and Dr. F. F. Gary, a South Carolinian physician, was expressing a popular and seemingly rational fear when in 1881 he declared that the "consequence of such [forest] destruction will be seriously felt, not only in our material wealth, but in an increased amount of sickness as well as in the climatic changes which are sure to follow."[40]

Similar fears were expressed on the west coast; Dr. Chipman of California wrote a long review article dealing with the economic, climatic, and health consequences of deforestation in various parts of the world. He concluded that California should undertake reforestation for both climatic and health reasons, even to the extent of planting trees in areas naturally devoid of such vegetation. Chipman urged that "belts of timber of forty rods in breadth be extended across the [Central] valley, with intervals of seven-eights of a mile between for cultivation."[41] These plantings in the sparsely wooded Central Valley of California, according to Dr. Chipman, would give rise to various economic and esthetic benefits as well as to "the purification from all miasmatic effluvia" of the area.[42]

Another Californian of the period, Franklin B. Hough, a physician writing as Forestry Commissioner for California, took a middle position on the health consequences of deforestation. Dr. Hough held that densely forested regions tended to produce "malarious diseases of a typhoid, and sometimes of a malignant type."[43] However, he said that some trees were beneficial to health and provided climatic benefits; thus, for the optimal amount of tree cover there was "...a kind of golden mean between too little and too much, and no country or people is so fortunate as that wherein this due balance is carefully maintained."[44]

By the end of the 19th century belief in the direct sanitary influence of trees virtually had ended, supplanted by the germ theory of disease in which air properties and the presence of mysterious atmospheric toxins had no place. But the debate lingered on in the recesses of American public health concern. Thus, *The Pacific Medical Journal* in 1893 confirmed its

place far from the van of medical progress with an editorial titled "The Influence of Forests on Health" which obliviously asserted "there seems to be no doubt that forests exert a salubrious influence on health." This editorial also repeated the claim "that no epidemic ever spread in the vicinity of a forest."[45] Similarly, a physician from Guadalajara, Mexico, addressed the American Public Health Association in 1897 and once more touted the old miasmatist doctrine, complete with references to air purity and balsamic air.[46]

By this time, however, the trees and health issue was moribund, largely discarded in serious medical circles and sustained mainly by the advocates (many of whom were laymen) of the open-air treatment for tuberculosis and other diseases. From such die-hard ranks came David Starr Jordan, the educator and naturalist, who declared in 1907 that the "invalid finds health in California only if he is strong enough to grasp it. To one who can spend his life out of doors it is indeed true that 'our pines are trees of healing.' "[47] Pliny the Elder would have agreed.

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